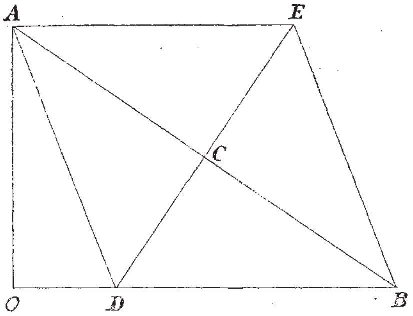
	Droughts.	Floods.
Minimum Group (11th, 1st, and 2nd Series)	13	2
Intermediate Group (3rd, 4th, 9th, and 10th Series) ...	10	4
Maximum Group (5th, 6th, 7th, and 8th Series) ...	7	6

Of the seventeen cycles of eleven years, between 1711 and 1877, only three have no record of one or more dry years. The great droughts were those of 1722, 1778, 1792, 1825, 1845, and 1877, of which four occurred in the minimum group, one commenced in that group, but culminated in the intermediate group, and one was confined to the latter group.

Rio de Janeiro, June 12 ORVILLE A. DERBY

The Cell of the Bee

THE following simple construction shows in one figure all the elements of a cell of a honey-comb. On two rectangular axes take OA and OB equal to the side and diagonal of a square. Join AB and bisect it in C. Draw CD normal to AB. Join AD, and complete the rhombus whose sides are AD, DB. Then if OA be a side of the hexagon, ADBE is one of the three equal planes forming the trihedral angle which closes the cell. The three short diagonals DE meet in the vertex of the cell, and are normal to each other. The three long diagonals AB form an equilateral triangle. OD is the height of the vertex above the hexagonal face of the prism. AED is the angle which the axis of the prism makes with each of the diagonals DE. ADO is the angle which the axis of the prism makes with each of the edges of the trihedral angle. The diagonals DE and AB are in the ratio of the side and diagonal of a square. Such a cell contains a maximum volume with a minimum surface.



Bardsea EDWARD GEOGHEGAN

OUR ASTRONOMICAL COLUMN

THE REPORTED OBSERVATION OF "VULCAN."—In the telegram received from Mr. Lockyer relating to the solar eclipse which appeared in NATURE last week (p. 353), and which, like many other similar messages, had suffered in course of transmission, mention was made of Prof. Watson's observation of an object of 4½ magnitude in R.A. 8h. 26m., and declination 18° 0′ north, which was neither a known planet nor a star. θ Cancri, a star of the fifth magnitude, is less than a degree from this position, but the observer would doubtless be aware of its presence. A telegram to the same purport was received by M. Mouchez, the director of the Observatory at Paris. By the formula deduced by Leverrier from the observations of suspicious objects in transit across the sun's disc, if the indeterminate *k* be put = 0, the elongation in longitude of his hypothetical body from the sun's centre at the time of totality at Prof. Watson's station would be 5°·9 eastward, and if $k = -1$, 9°·5 westward, neither of which, it will be seen, accords with the position given in the telegram. The fourth-magnitude star, δ Cancri, must have been within the limits of the coronal surroundings of the sun, and was only just beyond them during the total eclipse of July 28, 1851, when no observer, to our knowledge, remarked the star. In the instructions for observing the eclipse issued from the United States Naval Observatory, Washington, and prepared by Prof. Harkness at the instance of Admiral Rodgers, the superintendent, it is remarked: "As the truth of Leverrier's discovery of an apparently unexplained motion of the perihelion of Mercury is now established beyond all doubt, it is important to renew the search for an intra-Mercurial planet or planets." And to facilitate the work of such astronomers as might institute a search with considerable telescopic power, a chart was appended to the instructions showing every star so large as the seventh magnitude in that portion of the heavens occupied by the sun at the time. This chart extends from 7h. 32m. to 9h. 40m. in right ascension, and from 11° to 26° in declination. θ Cancri, the only star which appears near the position indicated for Prof. Watson's object, is marked on the chart as a sixth magnitude, which is the estimate of the *Uranometria* and *Durchmusterung*, but the star has been occasionally rated a fifth magnitude as in the first Radcliffe Catalogue, wherein particular attention was paid to the brightness of the stars. This is only a half-magnitude below Prof. Watson's estimate, but it remains to be seen from further intelligence whether there was any possibility of the star having been the object really noted; if it were separately remarked, or if the observed position does not admit of such change as would be necessary for identification, then it may truly be said that the American astronomer will have rendered the occasion of this eclipse a memorable one in the history of the science. Leverrier's confidence in the existence of an unexplained motion in the perihelion of Mercury and the necessity of accounting for it, by admitting the presence of matter in some form within the orbit of the planet, continued undiminished up to the time of his decease. One of his last communications to the writer of these lines was upon this subject.

THE LUNAR ECLIPSE ON AUGUST 12.—The eclipse of the moon on August 12 is the only one that will be wholly visible in this country until the year 1884; first contact with the earth's dark shadow at 10h. 42m., the middle of the eclipse at 12h. 8m., magnitude 0·59, and last contact at 13h. 34m. On October 4, 1884, there will be a total eclipse of the moon, the middle near 10 P.M., and the passage through the shadow nearly central.

THE AUGUST METEORS.—The earth will arrive at the descending node of the orbit of the comet 1862 III., in the track of which the meteors of the August period are found to move, soon after noon on Saturday next; the comet itself has now receded from the sun to a distance nearly equal to the mean distance of Neptune, to return to these parts of the system probably between 1980 and and 1985. Moonlight interferes this year with observation of the smaller meteors August 9-11, during a part of the night.

TEMPEL'S COMET.—The following places of this comet are deduced from M. Schulhof's elements, with the time of perihelion passage, corrected by the early observations at Strasburg by Prof. Winnecke:—

12h. G.M.T.		Right Ascension.			North Polar Distance.		Log. Distance from Earth.	Intensity of Light.
		h.	m.	s.	°	′		
August	23	16	20	30	109	3	9·9018	0·86
,,	25	—	25	55	109	52		
,,	27	—	31	28	110	40	9·9079	0·84
,,	29	—	37	12	111	27		
,,	31	—	43	6	112	13	9·9144	0·82
September	2	—	49	10	112	58		
,,	4	16	55	24	113	42	9·9213	0·80
,,	6	17	1	48	114	24		
,,	8	—	8	22	115	5	9·9286	0·77
,,	10	—	15	5	115	44		
,,	12	—	21	58	116	22	9·9365	0·74
,,	14	—	29	0	116	58		
,,	16	17	36	11	117	33	9·9448	0·71

On September 10 the comet passes very near to the orbit of Mars, but the planet is far distant. The dimen-

© 1878 Nature Publishing Group

sions and eccentricity of the orbit of the comet are now :—

Perihelion distance ...	1·3393	Semi-axis major ...	2·9956
Aphelion ,, ...	4·6518	,, minor ...	2·4961
Eccentricity ...	0·55289		

The interval between the perihelion passages in 1873 and 1878 is 1899·78 days.

BIOLOGICAL NOTES

THE PRIMARY GERM-LAYERS AND THE ORIGIN OF THE MALE AND FEMALE REPRODUCTIVE ELEMENTS.—Prof. Edouard Van Beneden, of Liége, three years ago observed that in the marine hydroid polyp Hydractinia the cells forming the testis and giving rise to spermatozoa, were derived from an ingrowth of the outer of the two primary cell-layers which form the foundation of all higher animal bodies, whilst the ova, he found, were simply cells of the inner primitive layer. This complementary function of the ectoderm and endoderm in Hydractinia led him to frame the hypothesis that throughout the animal kingdom the outer cell-layer is male in function, and the inner cell-layer female. On reviewing the facts known as to the derivation of the sexual cell-elements in various groups of animals, he was able to show a considerable amount of evidence in favour of the view that the testis is always ectodermal and the ovary always endodermal. Though accurate observations in this matter are excessively difficult, and definite knowledge as to the facts, in nearly all cases, is still wanting, yet Prof. Van Beneden's hypothesis was plausible and worthy of full consideration. It has been adopted by Gegenbaur in the last edition of his "Grundriss." The hydroid polyps consisting, as they do for the most part, of the two primary cell-layers in a very slightly differentiated condition, present the most ready field for the further testing of Van Beneden's hypothesis. The observations of Kleinenberg on Hydra were opposed to it. According to these *both* the sperm-cells and the egg-cells of Hydra develop from the ectoderm. Mr. J. Ciamician, of Vienna, has made a special study of this question in certain genera of hydroids (*Zeitsch. wiss. Zoologie*, 1878, part 4), and has published careful drawings in support of his statements. In *Tubularia mesembryanthemum*, assuming the accuracy of Mr. Ciamician's drawings, both female and male reproductive cells develop from a hollow in-growth of the ectoderm (the gonophors of the two sexes being distinct), which at first depresses the endoderm, but is afterwards itself flattened out by the up-growth of the endodermal layer of the spadix. In *Eudendrium ramosum* the ova develop from cells of the ectoderm, and the sperm-cells from cells of the endoderm, precisely the reverse of the relations detected by Van Beneden in Hydractinia. It seems hardly possible to interpret Mr. Ciamician's drawings of Eudendrium in any other sense than that which he himself adopts; the cell-layers at all stages are as clear in this species as they possibly can be. In the female gonophors of Hydractinia, Van Beneden saw an in-pushing of ectoderm at the apex developed in the same place as the in-pushing at the apex of the male gonophor, from which the sperm-cells developed. Van Beneden interpreted the rudimentary in-pushing in the female gonophor as a survival of a primitive hermaphrodite condition of the gonophors. Ciamician considers, on the contrary, that this ectodermal in-pushing is only the commencement of the formation of a medusa (in fact, the space between umbrella-margin and manubrium), which, instead of being completed, subsides into the condition of a medusoid gonophor. Hence, in place of a constant law of ectoderm being male and endoderm being female, we have in the three genera Tubularia, Hydractinia, and Eudendrium, the following variations respectively :—1, ectoderm male and female; 2, ectoderm male, endoderm female; 3, ectoderm female, endoderm male. The only possible generalisation from these facts is that of Ciamician, viz., that primitively the sexual functions are not assigned exclusively to cells of either layer: ectoderm may produce both male and female elements, and so may endoderm. With increased development and specialisation of structure, the production of reproductive elements would become limited to particular tracts of cells, and these would be necessarily *either* exclusively endoderm-cells or exclusively ectoderm-cells, but might be either one or the other indifferently even in closely-allied genera; and might be the same or complementary for the ovary and testis respectively. Nevertheless it must be admitted that though such indefiniteness in the relation of the sexual glands to the primitive cell-layers might be expected in Cœlentera where the differentiation of the two layers is at its commencement (both layers, for instance, developing nematocysts), yet in the higher groups of the animal kingdom we should be justified in looking for absolute constancy in the derivation of ovary and testis respectively from one or other (the same or diverse) of the two cell-layers—and we have not ground for supposing that this derivation would be the same in each of the great phyla until we can show that it is more constant in the Vermes than in the Cœlentera. E. R. L.

THE TOILET HABITS OF ANTS.—The Rev. H. C. McCook, of Philadelphia, eulogises the neatness of the agricultural ant, as observed in confinement at any rate. The most minute particles of dirt are carefully removed, and the whole body is frequently and thoroughly cleansed, especially after eating and sleeping. They assist each other in the general cleansing, and the attitude of the ant under operation is one of intense satisfaction, like that of a family dog being scratched, a perfect picture of muscular surrender and ease. Mr. McCook has seen an ant kneel down before another, and thrust forward the head under the face of the other, and lie motionless, expressing quite plainly the desire to be cleansed; the other ant understood this, and went to work. Sometimes this is combined with acrobatic feats, in which these ants excel, jumping about and clinging to blades of grass in a remarkable fashion. Sometimes the cleansing ant hangs downward from the grass, and to her the ant operated upon clings, reaching over and up with great agility to submit to her friend's offices. Evidently moisture from the mouth is used for washing. Mr. McCook has observed most minutely the whole of these processes, which are recorded in the Philadelphia Academy's *Proceedings* for this year. He suggests that with ants as with the human kind an artificial condition induces greater attention to personal appearance.

THE MODE OF RECOGNITION AMONG ANTS.—The combats and communications of ants are among the most interesting and mysterious phenomena. The Rev. H. C. McCook has given an account to the Academy of Natural Sciences at Philadelphia of some experiments he has made to determine what is the mode of recognition among ants. He has studied the pavement ants (*Tetramorium cæspitum*), which he has observed engaged in continued combat for over a fortnight, the warriors being only the workers or neuters. There is no distinguishable difference between the ants of the fighting parties, yet they recognise each other infallibly as friend or foe. They challenge all comers with their antennæ; if they are friends, they pass on; if foes, they straightway interlock and "fall to." Sometimes many ants are congregated against one, which is being torn limb from limb. Mr. McCook surmised that recognition was based upon a certain odour emitted by the respective factions. He found that if they were enveloped in an odour of eau-de-Cologne, while not at all deprived of activity, all became harmonious; those who were previously engaged in

© 1878 Nature Publishing Group